



United States
Department of
Agriculture

Forest
Service

March 2014



Environmental Assessment

Kenai Peninsula Invasive Plant Treatment Project

Glacier and Seward Ranger Districts, Chugach National Forest, Alaska

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Introduction

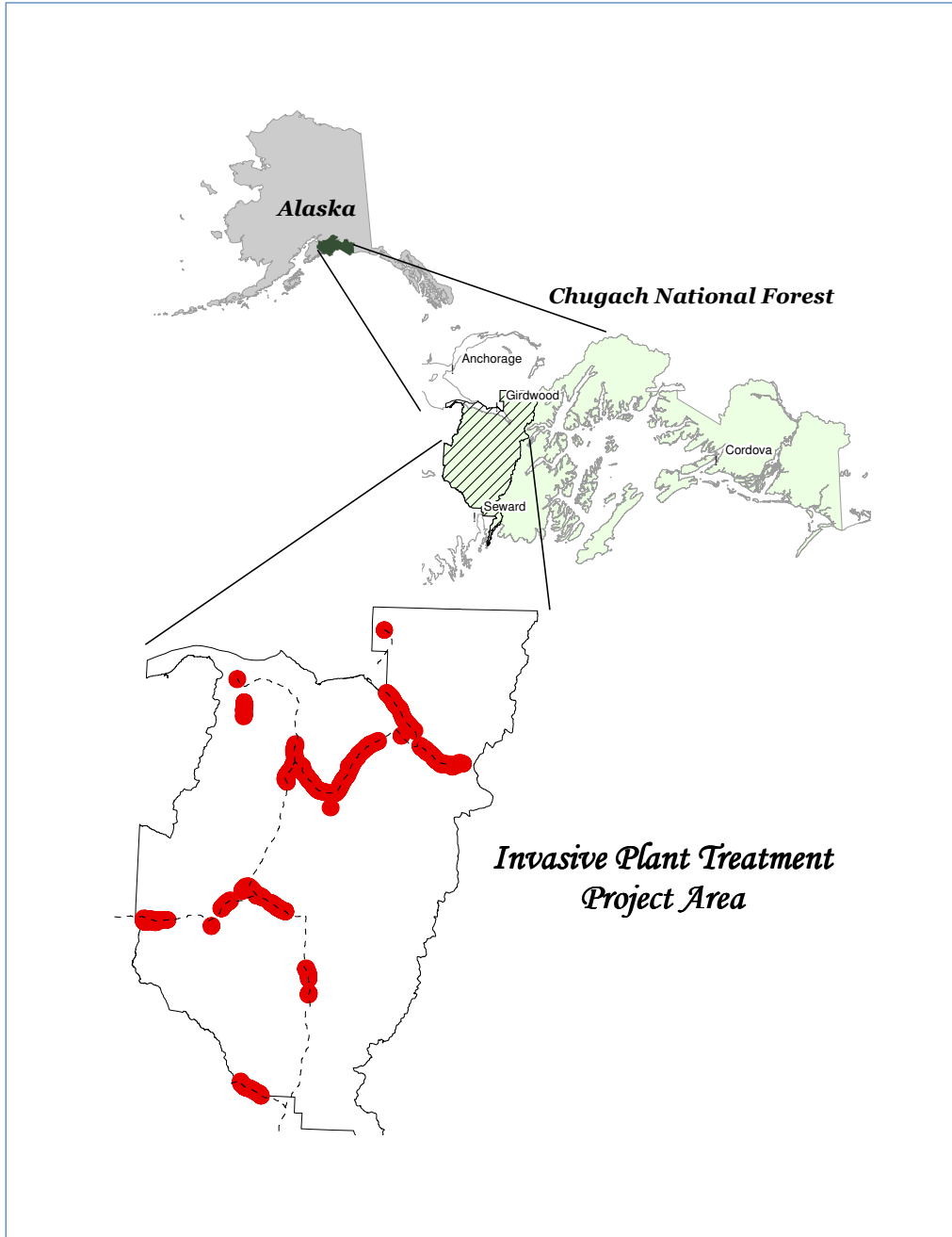
The Forest Service has prepared this environmental assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and state laws and regulations. This EA discloses the direct, indirect, and cumulative environmental consequences that would result from the proposed action and alternatives. Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Glacier Ranger District Office in Girdwood, Alaska.

Background

The Forest Service proposes to eradicate, control, or contain non-native invasive plants within the Chugach National Forest on the Glacier and the Seward Ranger Districts and two small areas on State lands within the Kenai Peninsula (see Map 1). Non-native plants are species that accidentally or purposefully are growing in ecosystems where they did not evolve and grow over a long period of time. Invasive plants are defined as those species whose introduction is likely to cause economic or environmental harm or harm to human health. Non-native plants refer to species that are not native to that ecosystem. Invasive plants displace or alter native plant communities and cause long-lasting economic and ecological problems within and outside the National Forest. They can increase fire hazards, degrade fish and wildlife habitat, out-compete native plants, impair water quality and watershed health, and adversely affect a wide variety of other resource values such as scenic beauty and recreational opportunities. Invasive plants can spread rapidly across the landscape to all land ownerships. Adjacent federal land managers, Kenai Fjords National Park and Kenai National Wildlife Refuge, actively manage invasive plants using integrated weed management techniques including a broad use of herbicide chemical. The State of Alaska has also recently modified their permitting requirements to facilitate use of chemical control on state owned lands. The Chugach National Forest currently uses herbicide in limited areas and has mainly relied on manual and mechanical control methods, which are inefficient and ineffective in many areas. Owing to the relative rarity of invasive plants within natural communities in the project area, land managers on the Forest are in a unique position to prevent invasive plant problems before they occur or control them before they expand beyond a reasonable capability to do so (Duffy 2003).

Surveys have found that most invasive plant occurrences on the Forest are in areas of intensive human-caused disturbance such as road edges, visitor facilities, trailheads, mineral material sites, and trails. The primary vector for spreading invasive plants is human activity, such as driving through a roadside infested area and spreading seed and other plant material. Invasive plants have been found on about one percent of backcountry sample plots on the Forest. None of the backcountry occurrences on the Kenai Peninsula are of highly invasive species (DeVelice 2013). The rate of spread of invasive plants on the Forest is expected to increase in response to increased human development and use, climate change, insect infestations, and fire.

The field inventories discussed above have identified 84 non-native plant species within the boundaries of the 1.3-million acre project area. Species of greatest concern include Canada thistle, orange hawkweed, reed canarygrass, and bird vetch, among others. Our ability to prevent or minimize the adverse impacts of these and other invasive plants is greatest if populations can be treated while they are small and in the early stages of invasion. Additional benefits of early stage treatments include reduced treatment costs, less herbicide use, and smaller, localized ground disturbance.



Map 1. Kenai Peninsula Invasive Plant Treatment Project Area outlined in black. Treatment areas are shown in red. Dashed lines are major roads.

Purpose and Need for Action

There is a need to reduce the extent of specific invasive plant infestations, and provide a mechanism to allow rapid response to newly emerging invasive plant infestations, to help protect uninfested areas from future introduction and spread of invasive plants. Invasive plant control actions have been occurring on the Chugach National Forest but have not always incorporated integrated methods that have been shown to be most effective. Most past efforts have been restricted to manual or mechanical control efforts such as hand pulling, digging, and tarping. Although manual control works in some cases, such as control of white sweet clover, it is both inefficient and ineffective for many infestations across the Forest. In some cases manual control can exacerbate the problem such as the case with orange hawkweed. More recently, the Forest has started including chemical control as an additional tool in invasive plant management in limited areas such as administrative sites, recreation sites and facilities, and the Spencer Lake area. In general, chemical control is highly effective and efficient and some infestations appear to be nearly eradicated after only one or two applications, such as control of reed canary grass at Russian River recreation site. Integrating more chemical control options would greatly improve control and eradication of many invasive plant infestations, especially newly emerging infestations and existing infestations where manual or mechanical control efforts have been ineffective or inefficient. In most cases, invasive plant occurrences are at road edges, facilities, mineral material sites, trailheads, and trails. Because invasive plants are still limited in population on the Chugach National Forest, we have an opportunity to proactively limit their growth on the landscape. In total, the area of priority species infestation on the entire 5.5-million acre Chugach National Forest is estimated at less than 1,000 acres (DeVelle, R.L., *personal communication*).

The purpose of this project is to control or eradicate known invasive plant infestations and treat new infestations in an efficient and cost-effective manner that complies with environmental standards. This would move us toward the goal and objectives stated in the Chugach National Forest Land and Resource Management Plan on page 3-4:

Goal: “Prevent introduction and spread of exotic plants and reduce areas of current infestation.”

Objectives: “Identify infestations of exotic plant species and maintain infestation data in a standard database....Treat infestations with a high potential to spread.”

This project incorporates a strategy that assists in the determination of whether an invasive plant will be tolerated on the landscape or if the invasive plant needs to be controlled or eradicated. This project will expand integrated treatment methods such as physical (hand pulling and tarping), mechanical (mowing or torching), and cultural (seeding or planting competing native vegetation) with more chemical (herbicide) to eradicate or control invasive plant infestations. The goal is to manage invasive plants in a manner to prevent adverse impacts to natural resource values while minimizing adverse impacts of management efforts.

Proposed Action

The actions proposed by the Forest Service to meet the purpose and need are summarized below and described in detail under Alternative 2. The Forest Service proposes to treat invasive plants using integrated weed management techniques and in particular expand chemical control methods within the project area shown in Map 1. Project design criteria (pages 9-10) have been included to

minimize adverse impacts of management actions, such as human contact with herbicides, accidental spray of non-target organisms and water resources. Herbicides proposed to be used include glyphosate and aminopyralid which are discussed in detail on pages 11-13. Surfactants, which are compounds commonly added to herbicides to improve performance, are also discussed on pages 11-13.

Existing invasive plant infestations occurring within proposed treatment areas shown in red in Map 2 and in mineral material sites shown in Map 2 would be treated using spot hand spray applications of herbicide. Up to 50 acres of existing infestations would be treated annually. This proposal includes two known infestations on state land in the environmental analysis and though the Chugach National Forest may not directly implement these treatments, federal funds may potentially be used to implement these treatments, and the location of these infestations pose a risk of spreading invasive plants onto NFS lands, and are thus included in the proposed action.

Newly emerging invasive plant infestations would be treated within the project area increasing the likelihood of eradication before they become established and more difficult and costly to control. In general, new infestations are very small, thus less than one acre of new infestation would be treated annually. If a new infestation is larger than 1 acre, a separate analysis would be conducted.

Public Involvement

The proposal was listed in the schedule of proposed actions in the January, April, July, and October 2012 editions. A scoping package was mailed or emailed to 63 interested members of the public during scoping October 1, 2012, through November 1, 2012. Five individuals responded during scoping. Two issues were identified through this process are summarized below. The complete scoping analysis can be found in the project file.

Issue 1: Herbicide use may be detrimental to salmon spawning and salmon habitat.

This issue related to concerns of herbicide impacts to salmon and salmon habitat. This issue is addressed in the Environmental Consequences section on pages 21-22 of this EA.

Issue 2: Herbicide use may be detrimental to wildlife.

This issue related to concerns that herbicide use would harm wildlife. This issue is addressed in the Environmental Consequences section on pages 22-24 of this EA.

Alternatives, Including the Proposed Action

This chapter describes and compares the alternatives considered for the Kenai Peninsula Invasive Plant Treatment Project. It includes a description and map of each alternative considered.

Alternative 1 (No Action)

Under the no action alternative, current levels of invasive plant management would continue to occur. These actions include the following:

- Limited hand pulling in a variety of sites including backcountry areas, along trails, and near local communities.

- Glyphosate based herbicide control in areas covered by the Spencer Integrated Weed Management Environmental Assessment.
- Glyphosate and aminopyralid based herbicide control in administrative sites, recreation sites and facilities.

Alternative 2 (Proposed Action)

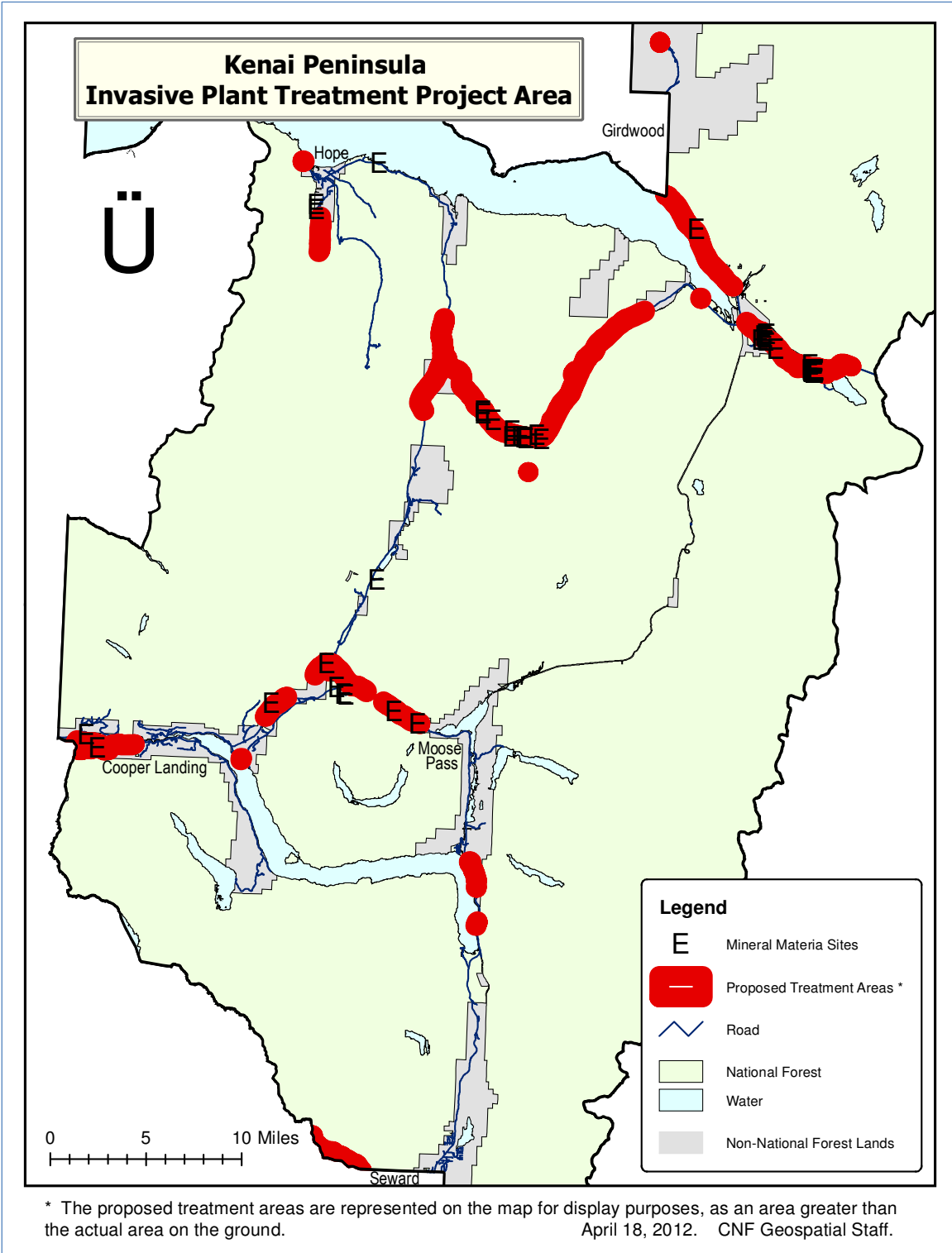
The proposed action is to treat invasive plants on the Kenai Peninsula within the Glacier and Seward Ranger Districts. The majority of treatments would occur on National Forest System (NFS) lands; however, there are two specific infestations that occur on State of Alaska lands. The first is an infestation of orange hawkweed located near MP 72 of the Seward Highway. The second is an infestation of bird's foot trefoil located under the Canyon Creek Bridge. Coordination has occurred with the State of Alaska to treat these infestations.

This proposal includes two known infestations on state land in the environmental analysis and though the Chugach National Forest may not directly implement these treatments, federal funds may potentially be used to implement these treatments, and the location of these infestations pose a risk of spreading invasive plants onto NFS lands, and are thus included in the proposed action.

The remaining infestations occur on NFS lands. Specifically, this alternative incorporates integrated weed management techniques and in particular expands chemical control methods using a two-prong approach as described below.

- **Existing Infestation:** Treat up to 50 acres per year of known invasive plant infestations found within treatments areas and mineral material sites shown in Map 2. Treatment areas contain infestations of nine of the most invasive plant species occurring within the Kenai Peninsula (Table 1). Additional species listed in Table 2 would also be treated in mineral material sites as shown in Map 2. These species have been included to comply with the Alaska State Weed Free Certification program for gravel. For all existing infestations, a combination of management techniques would be used to effectively and efficiently control a particular invasive plant infestation. The specific treatments proposed for each species are described in detail in Appendix 1 of this EA.
- **New Infestations:** Early detection and rapid response (EDRR) are critical components of an effective invasive species management program. Under this alternative, new infestations of invasive species found on NFS lands on the Kenai Peninsula would be treated using specific control measures found in Appendix 1. EDRR allows treatment of invasive species at the earliest stages of infestation when populations are still very small. New infestations of invasive species found on National Forest System lands in the Kenai Peninsula would be treated using specific control measures proposed by species for this project (Appendix 1). New infestations are likely very small, usually consisting of only several individual plants, and rarely exceed 1/10 acre.

Herbicides proposed to be used include glyphosate and aminopyralid which are discussed in detail on pages 11-13. Surfactants, which are compounds commonly added to herbicides to improve performance, are also discussed on pages 11-13. For all herbicide applications, only ground based methods using a hand/backpack sprayer would be used. No aerial or broadcast treatments are proposed. Spot hand spraying would be used to treat individual or groups of plants. This alternative also includes Design Criteria on pages 9-10 that details responsible use of herbicide. For example, these details include proper use of herbicide near water bodies and wetlands, application rates, and restricted areas.



Map 2. Proposed treatment areas for the Kenai Peninsula Invasive Plant Treatment project

Table 1. Estimated mapped acres of infestations of invasive plants

Name of invasive plant	Estimated acreage of current infestations
Canada thistle (<i>Cirsium arvense</i>)	1
Orange hawkweed (<i>Hieracium aurantiacum</i>)	5
Butter and eggs (<i>Linaria vulgaris</i>)	10
Bird's foot trefoil (<i>Lotus corniculatus</i>)	1
White sweetclover (<i>Melilotus alba</i>)	5
Yellow sweetclover (<i>Melilotus officinalis</i>)	3
Reed canarygrass (<i>Phalaris arundinacea</i>)	20
Field sowthistle (<i>Sonchus arvensis</i>)	1
Bird vetch (<i>Vicia cracca</i>)	10
Total approximate infested acres	56

Table 2. Alaska weeds of concern to be treated primarily in mineral material sites

Name of invasive plant
<i>Species occurring in the project area</i>
Wild oat (<i>Avena fatua</i>)
Narrowleaf hawkbeard (<i>Crepis tectorum</i>)
Quackgrass (<i>Elymus repens</i>)
Hempnettle (<i>Galeopsis</i> spp.)
Narrowleaf hawkweed (<i>Hieracium umbellatum</i>)
Fall dandelion (<i>Leontodon autumnalis</i>)
Oxeye daisy (<i>Leucanthemum vulgare</i>)
Black bindweed (<i>Polygonum convolvulus</i>)
Common tansy (<i>Tanacetum vulgare</i>)
Scentless false mayweed (<i>Tripleurospermum perforatum</i>)
<i>Species not known currently in the project area</i>
Spotted knapweed (<i>Centaurea stoebe</i> ssp. <i>micranthos</i>)
Field bindweed (<i>Convolvulus arvensis</i>)
Scotch broom (<i>Cytisus scoparius</i>)
Leafy spurge (<i>Euphorbia esula</i>)
Meadow hawkweed (<i>Hieracium caespitosum</i>)
Purple loosestrife (<i>Lythrum salicaria</i>)
Bohemian knotweed (<i>Polygonum</i> x. <i>bohemicum</i>)
Japanese knotweed (<i>Polygonum cuspidatum</i>)
Giant knotweed (<i>Polygonum sachalinense</i>)
Tansy ragwort/stinking willie (<i>Senecio jacobaea</i>)

Project Design Criteria for Alternative 2 (Proposed Action)

The following items are listed as design criteria that were developed to ensure the responsible use of herbicide and to minimize potential impacts associated with alternative 2, the proposed action.

- Herbicides application will target non-native species that do not respond to manual control methods. Manual control methods will continue to be used on species that respond well to those types of treatments.
- All applications of herbicides will adhere to required and recommended restrictions on the labels.
- The lowest application rate recommended for effective control of a given species will be used.
- Herbicides will be applied from hand carried or backpack equipment. Target species will be spot treated with hand-held applicators.
- Any chemical used for treatment will be covered in the risk assessment for herbicide use (see Table 4) or other more current USDA risk assessments as they become available.
- No spraying will occur within 60 feet of an Alaska Region sensitive plant population. Monitor known populations of *Papaver alboroseum* closest to proposed treatment areas for three years after treatment.
- No spraying will occur when the wind velocity is greater than 10 MPH to reduce off-site drift.
- No spraying will occur within 100-feet of surface water when using a terrestrial formulation of glyphosate herbicide (potentially with POEA surfactant). An aquatic formulation of glyphosate would be used up to 25 feet of surface water. Although an aquatic formulation is labeled safe to use around water, the 25-foot buffer has been added as an extra layer of caution. The aminopyralid herbicide can be applied up to 15-feet of surface water body. Label restrictions for aminopyralid state that this herbicide can be used to water's edge, however, the extra 15-foot buffer has been included as an added layer of caution. Surface water includes flowing streams, wetlands, wet meadows and standing bodies of water.
- Spraying will not occur during times of spring and early summer snowmelt runoff, or during times of typically heavy fall rainstorms. Likewise, spraying will not occur when rain is forecasted. If during implementation weather conditions change to rain, inform a fisheries representative in order to potentially monitor the site specific application.
- Monitoring of herbicide use will be completed on an annual basis and reported in the Forest Service corporate database, Natural Resource Information System (NRIS). Reports will be completed at the end of the treatment season (generally in the fall) to record types and amount of herbicides applied. Daily logs will be kept within the corporate Forest database where control activities occur. These logs will include information on the type of herbicide, pounds of active ingredient applied per acre, gallons of solution applied, method of application, and location.
- A safety plan will be developed prior to herbicide use that includes an emergency spill plan, material safety data sheets for each herbicide, and identification of appropriate personal protective equipment. All workers, including contractors, will receive training to carry out the safety plan and will have a copy of the plan in their possession during herbicide use.
- Best management practices will be followed prior to and during implementation, as described in the Forest Service Handbook 2509.22, the Region 10 Soil and Water

Conservation Handbook (USDA Forest Service, Alaska Region, 2006). BMPs applicable to this project include the following:

15.1: Pesticide Use Planning

15.2: Follow Pesticide Label and EPA Registration Directions

15.4: Pesticide Spill Contingency Planning

15.5: Protection of Water Quality, Wetlands, and Riparian Areas during Pesticide Application.

- When treating at or near recreation sites or trails, post information on bulletin boards the day treatment is applied, and retain posting for up to 3 days after treatment. Describe populations treated and chemicals used, relevant toxicity information, and who to contact for more information.
- Identify actual treatment areas with flagging, posting, or some other physical description.
- If any previously undiscovered endangered, threatened, or sensitive species are encountered during the implementation of this project, notify the Glacier Ranger District wildlife biologist or botanist for consultation and recommendation of appropriate mitigating measures to be enacted.
- In treatment areas within the Sqilantnu Archaeological District, the Chugach National Forest Heritage Program specialist will be consulted prior to treatment in order to identify specific areas of avoidance.
- Maintain a 330-foot-avoidance buffer from all active bald eagle nests identified in the wildlife specialist report during the March 1 to August 31 breeding season where disturbance within 330 feet of nests will be limited to less than 2 hours at one time. If additional bald eagle nests are located in or near the units, the wildlife biologist will be notified (USDA Forest Service 2002). Wildlife biologist will provide GPS locations of eagle nests for field avoidance of nests.
- Over time as funding permits, implement educational components to help prevent introduction and spread of non-native species on the National Forest. Such actions would likely include posting pictures and/or descriptions of the target species as well as recommended precautions the public can take when they encounter invasive plants. Boot brushes may be installed at trailheads to reduce unintentional spread of invasive plants from seeds or plant parts transported by boots. Information regarding the purpose and use of boot brushes would be clearly posted.
- Continue coordination with the Alaska State Department of Transportation and Public Facilities in the cooperative management of non-native species along major highways and roads.

Environmental Consequences

This section provides a summary of the environmental effects of each alternative. It discusses the effects relative to the key issues as well as the applicable physical, biological, and social environments within the project area. The discussions of resources and potential effects incorporate existing information included in the Revised Forest Plan Final Environmental Impact Statement, project-specific resource reports and related information, and other sources as indicated. The planning record for this analysis contains these sources of information as well as results of field investigations and public involvement efforts. The planning record is located at the Glacier Ranger District Office in Girdwood, Alaska, and is available for review during regular business hours. Information from the record is available upon request.

Herbicides and Surfactants

Concerns regarding herbicide use are key to the issues identified through the scoping process and is discussed in more detail in this section. For this project the herbicides glyphosate and aminopyralid are proposed to be used to control invasive plants in the project area. These herbicides have been selected because they are known to be effective on all the species in the project area (Carpenter and Murray 1998; Peachy 2008). Glyphosate is the active ingredient in products such as RoundUp[®] and Rodeo[®]. Typical application rate for glyphosate is 2 pounds per acre with the lowest at 0.5 pounds per acre and the high at 7 pounds per acre (Peachy 2008). These rates are generally based on broadcast applications. Spot applications, as proposed in this project, typically use less chemical because only individual plants are sprayed, not an entire area. Generally, spot application methods rarely approach typical application rates (Desser 2008). Therefore, the proposed action would likely use less than the typical rate of 2 pounds per acre. Since we do not know the exact amount, this analysis considers the typical application rate for broadcast applications of 2 pounds per acre as an additional layer of caution. For aminopyralid, the typical application rate is 0.078 pounds per acre with the lowest at 0.03 pounds per acre and the highest at 0.11 pounds per acre. Similar to the glyphosate discussion, the application rate would likely be closer to the lowest rate. However, since we do not know the exact amount, this analysis will consider the typical rate of 0.078 pounds per acre. Table 3 summarizes information on glyphosate and aminopyralid.

The effects from the use of any herbicide and surfactants depends on the toxic properties (hazards) of that chemical, the level of exposure to that chemical at any given time, and the duration of that exposure. This analysis incorporates by reference the Invasive Plant Toolbox, a recent invasive plant analysis completed by the Forest Service in Region 6, which used the herbicide risk assessment displayed in Table 4 to evaluate the potential for harm to non-target plants, wildlife, human health, and aquatic organisms from the herbicide and surfactants considered for use in this EA. This section summarizes the known information about herbicide and surfactants, discusses the approach taken in this EA, and discloses the uncertainties associated with herbicides and surfactants.

Table 3. Herbicide information summary

Active ingredient/ Selected herbicide brand names/ Mode of action	Properties	General uses/ Known to be effective on	Risks	Design features to minimize or eliminate risks
Glyphosate ■ 35 formulations, including RoundUp®, Rodeo®, Accord XRT®, Aquamaster®, etc. ■ Inhibits three amino acids and protein synthesis	■ A broad spectrum, non-selective translocated herbicide with no apparent soil activity; adheres to soil which lessens or retards leaching or uptake by non-targets	■ Low volume applications are most effective ■ Translocates to roots and rhizomes of perennials; while considered non-selective, susceptibility varies depending on species	■ Non-selective; greatest concern to aquatic organisms	■ Except for the aquatic formulation, do not use on soils with a high water table; buffers ensure that herbicide will not be delivered to water in concentrations that will affect aquatic ecosystems
Aminopyralid ■ Sold as Milestone® ■ Acts as a synthetic auxin, which mimics naturally occurring plant hormone auxin	■ Extremely selective for most all broad leaved plants. Grasses are tolerant ■ High water solubility ■ Does not bioaccumulate and is rapidly absorbed and excreted in mammals	■ Extremely low volume herbicide ■ Highly effective on many broad leaved plants	■ Greatest concern to non-target broad leaved plants	■ Drift management measures should be implemented to reduce non-target contact Do not apply directly to water and maintain a recommended 15-foot buffer around open water

Herbicide Risk Assessments

Risk assessments for glyphosate and aminopyralid were completed by Syracuse Environmental Research Associates, Inc. (SERA 2003, SERA 2007, and SERA 2011) using peer-reviewed articles from the open scientific literature and current EPA documents, including confidential business information. Information from laboratory and field studies of herbicide toxicity, exposure, and environmental fate was used to estimate the risk of adverse effects to non-target organisms.

The risk assessments considered worst-case scenarios including accidental exposures and application at maximum label rates. They measure risk with hazard quotients, the amount of herbicide or additive to which an organism may be exposed divided by the exposure threshold of concern. For the risk assessments the threshold of concern is the “no observable adverse effect” level, where research has shown no statistically significant effect when compared to organisms not exposed to these chemicals. Hazard quotients less than 1.0 indicate that the exposure poses little reason for concern. Hazard quotients near 1.0 or greater potentially pose concern. The risk assessment for glyphosate (SERA 2003 and SERA 2011) also considered the surfactant polyethoxylated tallow amine (POEA) which is included in some formulations with glyphosate. Although the risk assessments have limitations, they represent the best science available.

Table 4. Risk assessments for herbicides considered in this EA

Herbicide	Date final	Risk assessment reference
Glyphosate/POEA	March 1, 2003	SERA 2003 and SERA 2011
Nonylphenol Polyethoxylate (NPE) (Surfactant)	May 2003	Bakke 2003
Other Surfactants	January 2007	Bakke 2007
Aminopyralid	June 28, 2007	SERA 2007

Analysis of Surfactants

In addition to the analysis of potential hazards to human health from herbicide active ingredient, Bakke (2003 and 2007) and SERA (1997) evaluated available scientific studies of potential hazards of other substances associated with herbicide applications: impurities, metabolites, inert ingredients, and surfactants. There is usually less toxicity data available for these substances (compared to the herbicide active ingredient) because they are not subject to the extensive testing that is required for the herbicide active ingredients under Federal Insecticide, Fungicide, and Rodenticide Act.

Effects by Alternative for Each Resource

Human Health and Safety

Alternative 1 (No Action)

Direct, Indirect, and Cumulative Effects

There would be no immediate effect to human health and safety if no new action is taken to reduce the spread of invasive weeds as propose by this project. In the long term, however, if

these species are not controlled, there could be effects to the area's native plant and animal communities, which could then affect the health of humans that depend on these resources for subsistence.

Many factors contribute to human health in the Kenai Peninsula Zone, including the opportunity to collect and use native berries, mushrooms, and other plants, along with fish and game. The establishment and perpetuation of non-native species could reduce the area's native plant, fish and game resources, reducing the opportunity to collect and use these resources. Because it is unlikely that mechanical treatment alone would prevent the spread of invasive plants, this alternative could adversely impact people who use these Kenai Peninsula Zone resources.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

Worker Herbicide Exposure Analysis. Herbicide applicators are more likely than the general public to be exposed to herbicides. Worker exposure is influenced by the application rate selected for the herbicide, the number of hours worked per day, the acres treated per hour, and variability in human dermal absorption rates. Appendix Q: Human Health Risk Assessment in the Region 6 Invasive Plant FEIS (USDA Forest Service 2005) displayed hazard quotient values for typical and maximum label rates under a range of conditions. Four potential exposure levels were evaluated for workers, ranging from predicted average exposure (typical application rate-typical exposure variables) to a worst-case predicted exposure (maximum application rate-maximum exposure variables). The addition of protective gear is a variable that would reduce worker exposure.

In routine broadcast and spot applications, workers may contact and internalize herbicides mainly through exposed skin, but also through the mouth, nose, or lungs. Contact with herbicide formulations may irritate eyes or skin.

The herbicides proposed for use under alternative 2, used at rates and methods consistent with the project design criteria, have little potential to harm humans. Recent analyses shows that in most cases, even when maximum rates and exposures are considered, hazard quotient values were below the threshold of concern of 1 (hazard quotient values ranged from 0.01 to 0.3) (USDA Forest Service 2005; SERA 2007). Therefore, the amount of plausible worker exposure is below levels of concern for spot spray methods. Project design criteria further reduce both the application rate and the quantity of drift.

Chronic (daily over a period of time) worker exposure was also considered in the 2003, 2007 and 2011 SERA Risk Assessments. Chronic exposures do not amount to levels of concern because the herbicide ingredients are water-soluble, rapidly absorbed and are not retained in the body (they are rapidly eliminated).

Public Herbicide Exposure Analysis – Direct Contact, Special Forest Products and Subsistence. The general public would not be exposed to substantial levels of any herbicides used in the implementation of this project. Recent analysis (USDA Forest Service 2005) considered plausible direct, acute, and chronic exposures from herbicide ingredients. There are few plausible scenarios that would exceed even the most conservative threshold of concern for public health and safety. The risk assessments display results for the following scenarios.

Direct Contact: There is virtually no chance of a person being directly sprayed given spot and hand/select methods considered for this project. A person could brush up against sprayed vegetation soon after herbicide is applied. Such contact is unlikely because public exposure

would be discouraged during and after herbicide application. Even if a person were directly sprayed with herbicide applied at typical broadcast rates, chemical exposure would not exceed a level of concern (hazard quotient is under 0.09 for glyphosate, 0.004 for aminopyralid and under 0.3 for NPE) (Sera 2003, 2007; USDA 2005).

Eating Contaminated Special Forest Products: The public may be exposed to herbicide if they eat contaminated fish, berries, or mushrooms, etc. Non-target, native berries or mushrooms may be affected by drift or runoff. Several exposure scenarios for recreational and subsistence fish consumption were considered in the SERA Risk Assessments; none are near any herbicide threshold of concern. Fish contamination is unlikely given the project design criteria that reduce potential herbicide delivery to water.

Exposure scenarios have been considered for both short-term and chronic consumption of contaminated berries. The herbicide dose from eating a quantity of mushrooms would be greater than for the same quantity of berries (Durkin and Durkin 2005). The dose, however, would be less than the dose from a dermal contact with sprayed vegetation scenario, and thus, below the threshold of concern (hazard quotient less than 1). Hazard quotient values for eating contaminated fish or berries range from 0.00000005 to 0.04 for glyphosate and 0.00008 to 0.7 for NPE. For aminopyralid, the upper bounds of hazard quotients associated with the longer-term exposures at the maximum application range from 0.000008 to 0.01 (SERA 2007).

People who both harvest and consume special forest products may be exposed both through handling contaminated plant material and chewing or eating it. Chewing and eating contaminated plant material cause different exposure and dose patterns. Such doses would be additive, but are unlikely to exceed the threshold of concern (see “Cumulative Effects” discussion below).

Drinking Contaminated Water: Acute exposures and longer-term or chronic exposures from direct contact or consumption of water, fruit, or fish following herbicide application were evaluated in the risk assessments. Risks from two hypothetical drinking water sources were evaluated: (1) a stream, into which herbicide residues have contaminated by runoff or leaching from an adjacent herbicide application; and (2) a pond, into which the contents of a 200-gallon tanker truck that contains herbicide solution is spilled.

The only herbicide/surfactant scenarios of concern would involve a small child (2 to 3 years old) drinking from a pond shortly after an accidental spill of a large tank of glyphosate solution. Aminopyralid under a similar scenario would be below a threshold of concern. This scenario would not occur under Alternative 2 since there are no cases that would require 200 gallons of herbicide at any single time and in fact would likely not exceed 20 gallons at any single time.

Cumulative Effects

While workers, and the public, may be exposed to herbicides within and outside the project area, multiple exposures do not necessarily equate to cumulative adverse effects. The herbicides proposed for use are water-soluble or rapidly absorbed, are rapidly eliminated from humans, do not concentrate in fatty tissues and do not significantly bioaccumulate (USDA Forest Service 2005; SERA 2007). Further, the project design criteria would limit the mechanisms by which workers and the public may be exposed to herbicides and were developed considering the risks and properties of the herbicides proposed for use. The project design criteria ensure that chronic (long term) and acute (short term) herbicide exposures would not exceed threshold of concern and sufficiently minimize risks to compensate for uncertainty about the impacts of herbicide use on

neighboring lands. At present, there are very limited herbicide treatments in or around the project area, further reducing chances of multiple exposures.

A person could be exposed to herbicide repeatedly over the course of their lifetime and exposure may occur any place that herbicides are used. Chronic exposure scenarios have been evaluated (USDA Forest Service 2005), including repeated drinking of contaminated water, repeated consumption of contaminated berries, and repeated consumption of contaminated fish over a 90-day period. The hazard quotient value for chronic exposures of the herbicide considered for this project is below 1 and thus below the threshold of concern.

A person could be exposed to herbicides by more than one scenario, for instance, a person handling, and then consuming sprayed berries. The cumulative impact of such cases may be quantitatively characterized by adding the hazard quotient values for each individual exposure scenario. An example of this scenario was considered for this cumulative effects analysis: the scenario assumes glyphosate contacts a person's bare skin (hazard quotient for dermal exposure is less than 0.01), and that person immediately eats contaminated berries and fish (hazard quotient values for oral exposure are less than 0.01). Even if these three exposures occurred simultaneously, the combined hazard quotient values are still far below a threshold of concern (hazard quotient less than 1).

The risk of adverse effects to human health is low because the herbicides proposed for this project are water-soluble, are quickly eliminated from the body, and do not bioaccumulate. All alternatives comply with standards, policies and laws aimed at protecting worker safety and public health.

Recreation

Alternative 1 (No Action)

Direct, Indirect, and Cumulative Effects

There would be no immediate effect to the recreation resource if no new action is taken to reduce the spread of invasive weeds as propose by this project. In the long term, however, if these species are not controlled, there could be effects to the scenery and fishing and hunting opportunities within the Kenai Peninsula Zone.

Many factors contribute to a quality recreation experience in the Kenai Peninsula Zone, including the aesthetics of landscapes, the chance to see wildlife, and the expectation of native flora. The establishment and perpetuation of non-native species would detract from this experience. Because it is unlikely that mechanical treatment alone would prevent the spread of invasive plants, this alternative would decrease the recreation user's enjoyment of the Kenai Peninsula Zone.

Alternative 2 (Proposed Action)

Direct, Indirect, and Cumulative Effects

This alternative would provide long-term beneficial impacts to the recreation resource. This alternative offers the best opportunity to maintain native flora and minimize the spread of invasive weeds. Because this alternative most quickly and effectively minimizes the establishment and spread of invasive weeds, it provides the best opportunity to provide quality recreation experiences.

There may be slight, short-term detrimental impacts as a result of chemical application. Some recreation users may feel concerned about impacts to dogs or small children or be nervous about setting up camp, or enjoying a picnic in an area possibly treated with chemicals. These short-term impacts are minimized with the design features and mitigation measures.

Botany

Alternative 1 (No Action)

Direct Effects

Within the project area there are three known sensitive and rare plant populations documented on the Chugach National Forest. There are also two more populations located just outside the project area and one population that has likely been extirpated. These populations were discovered during botanical inventories conducted by professional botanists or ecologists for other USDA Forest Service projects not related to this weed management project such as recreation developments, general weed inventories on roads, and other small district management projects. Since no new activities are proposed under the no-action alternative, no direct effects are anticipated.

Indirect Effects

Due to no new treatments taking place under this alternative, there would be no chance to indirectly affect any non-target rare plants with treatment processes. However, implementing the no-action alternative leaves non-target rare plants more vulnerable to future weed competition. Some weed species have the potential to threaten non-target rare plants species or their habitats over time depending on the site type and weed species involved. Therefore, there may be some indirect impact to non-target native or rare plant populations in this alternative due to no action taken.

Cumulative Effects

Cumulative effects are caused by the addition of the effects from this proposed action to all the other effects caused by actions that have taken place in the past, present and reasonably foreseeable future in the project area. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. This also includes natural disturbances, such as large scale landslides, wildfire, windfall of forests, and insect and disease outbreaks. Under the no-action alternative there could be some impact from cumulative effects on non-target rare plants because more weed infestations are very likely to increase on the landscape due to natural disturbances as well as management activities from the past, present and future in the project area. The potential for irreversible encroachment of the aggressive weed species is high. Some weeds would not be economically treatable if left unattended for the next 10 years.

Summary of Effects

Alternative 1 is the least effective alternative because it does not propose any new treatments of weeds and therefore would not meet the purpose and need of the project. This alternative is not expected to result in a loss of viability or a trend towards listing for any species in the next 10 years. However, our ability to protect native vegetation, sensitive plants and habitat in the long term is reduced under alternative 1. Weed infestations would not be contained or controlled. The potential for irreversible encroachment of some aggressive weed species on non-target native or

rare plant habitat or populations is high and would not be economically treatable if left unattended.

Specific to Alaska Region sensitive species, under alternative 1 there could be some effects because no management actions would be undertaken against weeds that may threaten sensitive species or their habitat in the next 10 years. There are 10 Alaska Region Sensitive species that either occur or are suspected to occur within the project area. Of the 10, only five have suitable habitat within the actual treatment areas. Of the five, only two have been found in close proximity to treatments areas (*Papaver alboroseum* and *Cypripedium guttatum*). The known populations of *Papaver alboroseum* still exist, however, the population of *Cypripedium guttatum* is believed to be extirpated and has not been found in recent years. Implementing this alternative: **May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability** to the following sensitive species: *Cypripedium guttatum*, *Ligusticum calderi*, *Papaver alboroseum*, *Piperia unalasensis*, and *Romanzoffia unalaschensis*.

Alternative 2 (Proposed Action)

Direct Effects

There would be no direct effects to Alaska Region sensitive plants with the implementation of this alternative. The project design feature of a 60-foot buffer around sensitive plant populations essentially eliminates the chance of accidental spray leading to direct impacts to sensitive plants. In addition, herbicide would be applied from hand carried or backpack equipment where target plants are spot treated with hand applicators. Due to these project design features, it is highly unlikely that damage due to drift would occur outside the area immediately adjacent to the application site (SERA 2007).

There are possible direct effects to adjacent non-target plants resulting from accidental spray. Non-target plants could be damaged or killed if they are accidentally sprayed with either herbicide. Since aminopyralid is only effective on broad leaved plants, grasses would not be affected by accidental spray with aminopyralid. Glyphosate is not selective and would damage or kill all plants that have been directly sprayed. Although accidental direct spray could potentially occur, it is highly unlikely given the spot spray method using a backpack or hand-held sprayer. Even if some non-target plants are inadvertently sprayed, the species that occur there are generally very common and the viability of those species would not be threatened. Indirectly and cumulatively, this alternative would be beneficial to the native vegetation because threats from invasive plants would be reduced.

Indirect Effects

Under this alternative, indirect effects could come from the following scenarios: herbicide drift; runoff; wind erosion; and percolation. The two herbicides proposed under this alternative include aminopyralid and glyphosate. Since they have varying effects, the two herbicides will be discussed separately relative to the four factors listed above.

Aminopyralid. Aminopyralid is a selective systemic herbicide that has been developed for the control of broadleaf weeds in rangeland, non-crop areas, and grazed areas (SERA 2007).

Herbicide drift: Drift could present a risk to non-target plants. However, effects associated with drift are greatly reduced by the following reasons. The method of spray is spot spraying using a backpack or handheld equipment where select plants can be individually targeted. The majority of target plants to be treated with herbicide occur relatively low to the ground, i.e., there are no

shrubs or trees being treated, which means the applicator wand would be closer to the ground further reducing the chance for drift. Additionally, spraying would not occur when wind velocity is greater than 10 MPH to result in off-site drift. Finally, sensitive plants are further protected by a 60-foot buffer.

Runoff: Runoff could occur under this alternative; however, project design features limit these potential effects. For example, spraying will not occur during times of spring and early summer snowmelt runoff, or during times of typically heavy fall rainstorms. Likewise, spraying will not occur when rain is forecasted or during windy conditions. Finally, this herbicide would not be used in areas within 15 feet of surface water sources, whereas the label instructions state this herbicide can be used to water's edge. This includes flowing streams, wetlands, and standing bodies of water. Any body of water can be a direct conduit to the downstream drainage network as well as the subsurface groundwater resources.

Wind erosion: In much of the proposed area, treatment areas are overlain by an organic surface layer that would inhibit wind erosion. In areas with bare mineral soil the potential for wind erosion is higher. However, the risks associated are still very low since the method of application is spot spraying directly to the target plant, limiting the amount of herbicide reaching bare ground.

Percolation: Studies show that aminopyralid can percolate to greater than 60 inches below the surface. This is well below the root zone for all non-target sensitive plants as well as many other plants in the project area (SERA 2007). In soil, the average half-life for aminopyralid is 35 days. In water the half-life is 0.6 day. However, recent studies in Alaska show that herbicide degradation greatly slows down during winter month and an accurate half-life could not be calculated (Seefeldt, S. *personal communication*). There is evidence in Alaska that aminopyralid appears to remain in soil and plants for up to two years following application, therefore label recommendations state that plants treated with aminopyralid not be used for any type of compost since they will continue to damage plants (Seefeldt, S. *personal communication*). However, there is little concern to soil organism since aminopyralid is broken down by soil microbes with low toxicity to soil organisms (Bautista and Bulkin 2007).

In conclusion, there would be no indirect effects to Alaska Region sensitive plants with this herbicide. Effects to other non-target plants would only potentially occur through accidental spray or minor herbicide drift. Even if some non-target plants are inadvertently sprayed, the species that occur there are generally very common and the viability of those species would not be threatened. Indirectly and cumulatively, this alternative would be beneficial to the native vegetation because threats from invasive plants would be reduced.

Glyphosate. This herbicide acts on plants by inhibiting or causing cessation of growth and cellular disruption.

Herbicide drift: Drift could present a risk to non-target plants. However, effects associated with drift are greatly reduced by the following reasons. The method of spray is spot spraying using a backpack or handheld equipment where select plants can be individually targeted. The majority of target plants to be treated with herbicide occur relatively low to the ground, i.e., there are no shrubs or trees being treated, which means the applicator wand would be closer to the ground further reducing the chance for drift. Additionally, spraying would not occur when wind velocity is greater than 10 MPH to result in off-site drift. Studies show no indication of damage resulting from glyphosate as close as 25 feet from application (Desser 2008). The 60-foot buffer around sensitive plant populations would essentially eliminate potential for impacts associated with drift.

Runoff: There is very low chance for impacts resulting from runoff to occur. Glyphosate is strongly adsorbed into soil, and essentially no absorption occurs through the roots (Smith and Oehme 1992). Microbial activity quickly degrades glyphosate in the soil. The project also includes design features limiting terrestrial formulations of glyphosate to 100 feet and aquatic formulations of glyphosate to 25 feet from open bodies of water.

Wind erosion: The hazard associated with wind erosion is below level of concern since there is no indication that glyphosate is likely to result in damage at distances as close as 25 feet from the application site.

Percolation: Since there is essentially no absorption occurring through the roots in the soil, there are virtually no impacts expected to non-target plants resulting from percolation. In the soil, glyphosate has a half-life ranging from 3 to 130 days (average is 47 days) with slower degradation during the winter. Recent studies in Alaska show that glyphosate degrades as expected during the summer. However, there was very reduced degradation in the winter and an accurate half-life could not be calculated (Seefeldt, S. *personal communication*). There is very little concern to soil organisms. Glyphosate is degraded by soil microbes and may cause a transient population decrease or increase in some bacteria and fungi (Bautista and Bulkin 2007).

In conclusion, there would be no indirect effects to non-target sensitive plants with this herbicide. Effects to other non-target plants would only potentially occur through accidental spray or minor herbicide drift. Even if some non-target plants are inadvertently sprayed, the species that occur there are generally very common and the viability of those species would not be threatened. Indirectly and cumulatively, this alternative would be beneficial to the native vegetation because threats from invasive plants would be reduced.

Cumulative Effects

Since direct or indirect effects are not expected or are anticipated to be extremely low, there are no anticipated cumulative effects to the non-target plants. The past, present and reasonably foreseeable future actions in the project area would have no additional impacts to non-target plants because the known rare and sensitive plants are protected or buffered in other management projects in the project area.

Summary of Effects

Under this alternative, herbicides would be used to control invasive plants. Although there is minor potential for herbicides to impact non-target plants, the likelihood is extremely low due to project design features and the nature of the herbicides proposed. Overall, impacts of continued introduction and spread of untreated invasive plants into native plant habitats are greater than the potential effects of herbicide treatments to sensitive plants.

Specific to Alaska Region sensitive species, there are 10 Alaska Region Sensitive species that either occur or are suspected to occur within the project area. Of the 10, only five have suitable habitat within the actual treatment areas. Of the five, only two have been found in close proximity to treatments areas (*Papaver alboroseum* and *Cypripedium guttatum*). The known populations of *Papaver alboroseum* still exist, however, the population of *Cypripedium guttatum* is believed to be extirpated and has not been found in recent years. Although the herbicide treatments in this alternative would reduce impacts of invasive plants to sensitive species, there is still a chance that invasive species would continue to persist in the project area due to new or undiscovered invasions or unsatisfactory response to treatments. Implementing this alternative: **May impact individuals or habitat, but will not likely contribute to a trend towards Federal**

listing or cause a loss of viability to the following sensitive species: *Cypripedium guttatum*, *Ligusticum calderi*, *Papaver alboroseum*, *Piperia unalaschensis*, and *Romanzoffia unalaschensis*.

Fisheries

Alternative 1 (No Action)

Direct, Indirect, and Cumulative Effects

Depending on the species and the degree of infestation, invasive plants can have negative impacts on aquatic species and their associated habitats. Left unmanaged, severe infestations of some plant species could out-compete native vegetation affecting a variety of riparian and aquatic functions at a site-specific scale including: (1) changes in stream temperature and light regime; (2) reduced dissolved oxygen concentrations; (3) altered streamflow; (4) soil stability and increased fine sediment inputs; and (5) altered stream nutrient supply affecting both aquatic and terrestrial insects and fish populations.

As a result of the no-action alternative, the continued existence and spread of invasive plants could eventually out-compete native plant species in riparian and aquatic habitats and potentially have one or more of the above-mentioned effects on local fish stocks. Although not every invasive plant species that has been identified in the analysis area is going to have significant effects on aquatic and terrestrial habitat important to fish, if left uncontrolled, there is a risk that the species presenting the biggest threat may expand to levels very difficult to control.

Alternative 2 (Proposed Action)

Direct Effects

Whereas numerous invasive plant species have been located and identified on the Chugach National Forest, the distribution has been limited primarily to areas of human disturbances and along roadways, recreation areas, mineral material sites, etc. Although waterbodies (lakes, rivers and streams) coincide with areas of human disturbance, direct effects to fish stocks and other aquatic organisms would only occur if a terrestrial formulation of glyphosate entered a water body in high enough concentrations to cause lethal or sub-lethal effects that impair biological functions. Sub-lethal effects can include changes in behaviors or body functions that are not directly lethal to the aquatic species, but could have reproductive, juvenile to adult survival, or other consequences. Because specific project design criteria developed for this project limit the use of terrestrial formulations of glyphosate to within 100 feet of water body, aquatic formulation of glyphosate between 100 and 25 feet of a water body, and aminopyralid to within 15 feet of a water body, no direct effects to the aquatic environment are anticipated.

Indirect Effects

Indirect effects of herbicide use can include alterations to the biological and ecological processes of aquatic and terrestrial plant and insect communities and their habitat. More specifically, effects can include changes of nutrient, sediment, and temperature characteristics of the water and terrestrial changes in cover, food, or other environmental component important to the development and survival of anadromous fish (Norris et al. 1991). Because the focus of this project is low-lying weeds and because only spot treatments of aminopyralid would be applied within a riparian area, no adverse effects to trees, woody terrestrial cover, terrestrial food sources or a change to water temperatures is anticipated. Weed treatment would result in dead weeds, but not bare-ground; therefore, an increase in sediment to waterways is not anticipated. In water, the

primary route of degradation of aminopyralid is photolysis. The photolysis half-life under standard conditions is 0.6 days indicating rapid degradation in surface water. Therefore, any change in the nutrient level of an affected water body would be short term and have no measurable effect on the aquatic environment.

Cumulative Effects

Because no direct or indirect effects are anticipated, there are therefore no cumulative effects.

Summary of Effects

Overall, direct, indirect, and cumulative effects associated with the proposed project would be limited in scope and would likely have no substantial effect to fish habitat and populations in the project area. Additionally, there are no listed or sensitive fish species known to exist in the project area. Whereas the actual amount of herbicide reaching water cannot be fully quantified, based on previous risk assessments developed by the Forest Service and Syracuse Environmental Research Associates using lab and field studies, modeling, peer-reviewed articles, and EPA documents, it has been determined that detrimental quantities of herbicide would not reach waters supporting anadromous fish and would have insignificant effects to natural aquatic and riparian processes in the analysis area.

Wildlife

Alternative 1 (No Action)

Direct and Indirect Effects

Since no specific activities are proposed under the no-action alternative, there would be no direct effects to wildlife or their habitats. For some species of wildlife, there may be indirect effects resulting from the continued persistence and spread of invasive species, which would displace native habitat over time. This would result in loss of forage and other vegetative features that provide habitat for a variety of wildlife species.

Cumulative Effects

As invasive plants continue to persist and spread throughout the landscape, they will cumulatively decrease the amount of native vegetation available for forage and habitat. Analyses of specific species of wildlife are found in the Wildlife Specialist Report located in the project record.

Alternative 2 (Proposed Action)

Direct, Indirect, and Cumulative Effects

Herbicide treatments can affect wildlife species through: (1) acute toxicity, (2) chronic toxicity, and (3) secondary effects upon habitat. Terrestrial animals might be exposed to any applied herbicide from direct spray, the ingestion of contaminated media (vegetation, prey species, or water), grooming activities, or indirect contact with contaminated vegetation, and these sources of exposure were considered in the risk assessments. The highest exposures for terrestrial vertebrates would occur after the consumption of contaminated vegetation or contaminated insects. Other routes of exposure, like the consumption of contaminated water or direct spray, lead to lower levels of exposure. In chronic exposure scenarios, the estimated daily doses at the upper limits of exposure are associated with highly conservative assumptions regarding the

consumption of contaminated vegetation. Specific analyses methods and analyses of individual wildlife species are found in the Wildlife Specialist Report located in the project file.

Aminopyralid

For acute and chronic exposures hazard quotients for aminopyralid are below the threshold of concern, 1.0, thus indicating there is a low level of concern that the amount of aminopyralid to be applied in the project would adversely affect wildlife. The chance of exposure depends partially on how the treatments overlap spatially with home ranges and habitat use patterns of animals.

Killing large populations of invasive weeds would likely increase the diversity of the herbaceous and shrub components of the treated areas. Aminopyralid is a selective herbicide that kills dicot, or broadleaf, plants, and thus would not be expected to kill off grasses. This would mean that grasses (and other monocots) would be able to increase, benefiting wildlife that feed upon grasses. However, some non-target dicots may be affected including willows, blueberry, and most shrubs, particularly dicots downwind of herbicide application sites could be adversely affected by drift or accidental spray (hazard quotient of 1.2 to 79). Depending on the dosage and the proximity to the herbicide application, and the size and health of the trees, individual leaves to entire plants could be damaged. The majority of target plants to be treated with herbicide occur relatively low to the ground, which reduces the chance for drift. Spraying would not occur when the wind velocity is high enough to result in off-site drift. Species of plants that could be accidentally sprayed or affected by drift are very common species, and generally species adapted to road edge or disturbed areas.

If there are synergistic effects of environmental stressors and the herbicide that would increase the sensitivity of wildlife to the herbicides (Relea 2005), some species in the wild may have a no observed adverse effect level (NOAEL) toxicity value half of what was determined in standard laboratory experiments. However, the central hazard quotient is still less than 0.5 of the toxicity value for all exposure scenarios.

In summary, aminopyralid could affect wildlife through the loss of some forage non-target plants. However, this injury or loss of non-target plants is expected to affect individual plants and not at a scale to measurably affect wildlife habitat.

Glyphosate

For acute and chronic exposures hazard quotients for glyphosate are below the threshold of concern, thus indicating there is a low level of concern that application of glyphosate would adversely affect wildlife. The chance of exposure depends partially on how the treatments overlap spatially with home ranges and habitat use patterns of animals.

Killing populations of invasive weeds would likely increase the diversity of herbaceous and shrub components of treated areas. Glyphosate is not a selective herbicide. Thus, some non-target plants would likely be damaged or killed if accidentally sprayed, although tolerant species would be less affected. Any accidental spraying of non-target plants is anticipated to be limited by use of a backpack sprayer for application, and not spraying in windy weather. Depending on the dosage and the proximity to the herbicide application, and the size and health of the trees, individual leaves to entire plants could be damaged. The majority of target plants to be treated with herbicide occur relatively low to the ground, which reduces the chance for drift. Spraying would not occur when the wind velocity is high enough to result in off-site drift. Species of plants that could be accidentally sprayed or affected by drift are very common species, and generally species adapted to road edge or disturbed areas. Studies have found no indication of plant damage from

glyphosate as close as 25 feet from application and a synthesis of studies recommends that 45 foot buffers are adequate (Desser, 2008).

If there are synergistic effects of environmental stressors and the herbicide that would increase the sensitivity of wildlife to the herbicides (Relea, 2005), some species in the wild may have a NOAEL toxicity value half of what was determined in standard laboratory experiments. However, the hazard quotient is less than 0.5 of the toxicity value for all exposure scenarios for all terrestrial species except for herbivorous and predatory insects in the high exposure scenario (Hazard Quotient of 0.6 to 1.2). Application rates of glyphosate are planned to occur at the low-middle exposure scenarios, although a high exposure scenario could accidentally occur on individual plants. Thus some insects may have mild non-lethal effects if high the exposure scenario occurs. Consumption of contaminated insects is well below 0.5 hazard quotient, and thus no effect to wildlife consuming insects is anticipated.

In summary, glyphosate could affect wildlife through the loss of some forage non-target plants. This injury or loss of non-target plants is expected to affect parts of or whole individual common plants and not at a scale to measurably affect wildlife habitat.

Summary of Effects

Overall the implementation of actions proposed in this alternative would not lead to measurable effects. Hazard quotients for both herbicides and known surfactants are below a level of concern for all groups of wildlife and specific species analyzed for this project. Analyses of specific species are found in the Wildlife Specialist Report located in the project record.

Heritage Resources

Alternative 1 (No Action)

Direct Effects

Since no activities are proposed there would be no direct effects of choosing the no-action alternative.

Indirect Effects

If the action is not carried out there may be undesired growth of vegetation that could begin to encroach on cultural features.

Cumulative Effects

There are no cumulative effects due to the lack of direct and indirect effects.

Alternative 2 (Proposed Action)

In accordance with Section 106 of the National Historic Preservation Act, 36 CFR 800, FSH 2360, and the Programmatic Agreement among the Alaska Cultural Heritage Program, Alaska State Historic Preservation Office, and Region 10 Alaska Forests, the Chugach National Forest Heritage Program has reviewed the scope and scale of the proposed project using predictive methods derived from the best available information on topography, hydrology, previous heritage program surveys, and site distribution patterns of known prehistoric and historic cultural resources within and near the area of potential effects. As a result of these efforts the following determination is provided for the project record:

The proposed project will cause no effect to historic properties (36 CFR 800.4(d)(1). No field survey is required due to sufficient and adequate previous survey and inventory (Alaska Programmatic Agreement, Appendix B, Stipulation 29-33):

29. Resource activities where minimal ground disturbance will not affect historic properties. These activities are limited to using powered or manual hand tools and heavy machinery is restricted to access that has already been established.

30. Aerial or hand application of fertilizer for seeding/mulching for the purpose of revegetation.

31. Planting or seeding in disturbed areas such as landslides, harvest units, skid trails, landings, degraded meadows, cable corridors, and borrow or quarry areas.

32. Noxious weed or invasive species eradication through the application of herbicides or hand removal where the Forest Service has determined such actions will not affect traditional gathering areas and/or resources that may be eligible for inclusion on the National Register.

33. Reintroduction of endemic or native faunal species into their historical habitats. However, habitat modification activities are not included.

This alternative also includes a design feature in treatment areas within the Squilantu Archaeological District (Russian River Campground area). The Chugach National Forest Heritage Program specialist will be consulted prior to treatments in order to identify specific areas of avoidance. All other treatment areas, including those areas in which historic mining sites are present may be treated as described in the project initiation letter. The described treatment will cause no effect to these historic properties due to the nature of the treatment.

Direct Effects

Due to the above information cultural resources will not be affected by this action.

Indirect Effects

Vegetation containing invasive species near some cultural resource sites would be better controlled, and the reduction of invasive plants in the vicinity may ultimately help preserve these sites.

Cumulative Effects

Due to a general lack of direct and indirect effects, no cumulative effects are anticipated. In the long term, as non-native invasive species are replaced with native species the environment containing cultural resources may become more conducive to preservation

Consistency

National Forest Management Act. The action alternative complies with the Forest Plan as documented in the project record. The Forest Plan complies with all resource integration and management requirements of 36 CFR 219 (219.14 through 219.27).

Endangered Species Act. Biological evaluations were completed for threatened, endangered, proposed, and sensitive plant and animal species. No threatened and endangered plant or animal species would be affected by any of the action alternatives.

Bald Eagle Protection Act. Management activities within bald eagle habitat will be in accordance to a memorandum of understanding between the Forest Service and the U.S. Fish and Wildlife Service.

ANILCA Section 810, Subsistence Evaluation and Finding. There is no documented or reported subsistence use that would be restricted by any of the action alternatives. For this reason, none of the alternatives would result in a significant possibility of a significant restriction of subsistence use of wildlife, fish, or other foods.

Coastal Zone Management Act of 1972, as amended. The alternatives would be consistent with the State of Alaska Coastal Zone Management Act to the maximum extent practicable.

Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended. The Magnuson-Stevens Fishery Conservation Act (the Act) requires that all Federal agencies consult with the National Marine Fisheries Service when any project “may adversely affect” essential fish habitat. The Act also requires that agencies with existing consultation processes contact the National Marine Fisheries Service to discuss how the existing processes can be used to satisfy the essential fish habitat consultation requirements (50 CFR 600.920(e)(3)). None of the alternatives will cause any action that may adversely affect essential fish habitat as defined by this Act.

National Historic Preservation Act of 1966. Section 106 of the National Historic Preservation Act requires that all Federal undertakings follow the regulations found at 36 CFR 800 to identify and protect cultural resources that are within project areas and which may be affected by projects. The Chugach National Forest will follow the procedures in the Programmatic Agreement between the Chugach National Forest, the Advisory Council on Historic Preservation, and the Alaska State Historic Preservation Officer.

Executive Order 11988 – Wetlands. Wetlands occur in the project area. Project design criteria will minimize the impact to wetlands in accordance with E.O. 11988.

Executive Order 11990 – Floodplains. Floodplains occur in the project area. Project design criteria will minimize the impact to floodplains in accordance with E.O. 11990.

Executive Order 12898 - Environmental Justice. Implementation of this project is not anticipated to cause disproportionate adverse human health or environmental effects to minority or low-income populations.

Executive Order 12962 - Recreational Fisheries. No major adverse effects to freshwater or marine resources would occur with implementation of this project.

Clean Water Act. The project design is in accordance with Forest Plan standards and guidelines, best management practices, and applicable Forest Service manual and handbook direction. The project activities are expected to meet all applicable State of Alaska water quality standards.

Clean Air Act. Emissions anticipated from the implementation of the action alternative would be of short duration and would not be expected to exceed State of Alaska ambient air quality standards (18 AAC 50).

Executive Order 13112 - Invasive Species. Invasive species populations have the potential to spread in the project area. The purpose of this proposal is to reduce the spread of invasive species in accordance with E.O. 13112.

Public Law 106-224 – Plant Protection Act. Invasive species populations have the potential to spread in the project area. The purpose of this proposal is to reduce the spread of invasive species in accordance with P.L. 106-224.

Roadless Area Conservation Rule. This proposal does not propose any timber harvesting, road building or any type of road modification. Therefore, the Roadless Rule does not apply to this project.

Consultation and Coordination

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

ID TEAM MEMBERS:

Betty Chamon, Co-Team Leader and Ecologist

Rob DeVelice, Co-Team Leader and Ecologist

Cristi Corey-Luse, Team Leader through the Scoping phase of project

Alison Rein, Human Health and Recreation Specialist

John Lang, Fisheries Biologist

Jessica Ilse, Wildlife Biologist

Sherry Nelson, Archeologist

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Appendix 1: Common Control Measures for the Kenai Invasive Plant Treatment Project

What are “common control measures?” Common control measures are different methods of treating invasive plants. They can include a wide variety of options. The challenge with invasive plants is finding the best way to control or eradicate them. Having more than one way to treat an invasive plant gives the land managers the flexibility they need to successfully address the infestation and help to restore affected ecosystems while minimizing any potential adverse effect from the treatments themselves.

Table A-1 lists by species proposed common control measures that would be proposed in this project.

Table A-1. Proposed target species and common control measures proposed in this project

Target species Common names Scientific names Growth habit Invasiveness ranking	Proposed control measures	Proposed herbicide	Extent of infestation (occurrences)
Canada thistle <i>Cirsium arvense</i> Perennial Rank: 76	Manually pull or dig small populations of 10 plants or less. Monitor effectiveness for 1 year and spot spray with a hand held or backpack sprayer with aminopyralid if manual control is ineffective. For populations larger than 10 plants, spot spray with aminopyralid. All label instructions would be strictly adhered to.	Yes	1
Orange hawkweed <i>Hieracium aurantiacum</i> Perennial Rank: 79	Past manual treatments on the Chugach National Forest have been ineffective in controlling this species. Spot spray plants with a hand held or backpack sprayer with aminopyralid. All label instructions would be strictly adhered to.	Yes	14
Butter and eggs <i>Linaria vulgaris</i> Perennial Rank: 69	Manually pull or dig small populations of 10 plants or less. Monitor effectiveness for 1 year and spot spray with a hand held or backpack sprayer with aminopyralid if manual control is ineffective. For populations larger than 10 plants, spot spray with aminopyralid. All label instructions would be strictly adhered to.	Yes	83
Birdsfoot trefoil <i>Lotus corniculatus</i> Perennial Rank: 65	Manually control this species by digging out the roots. Monitor for effectiveness. If populations are expanding then supplement manual control with spot spraying with a hand held or backpack sprayer with aminopyralid. All label instructions would be strictly adhered to.	Yes	1
White sweetclover <i>Melilotus alba</i> Biennial Rank: 81	Manually control this species by hand pulling. Ensure that a majority of the roots are extracted. Monitor for effectiveness.	No	38
Yellow sweetclover <i>Melilotus officinalis</i> Annual or biennial Rank: 69	Manually control this species by hand pulling. Ensure that a majority of the roots are extracted. Monitor for effectiveness.	No	21

Target species Common names Scientific names Growth habit Invasiveness ranking	Proposed control measures	Proposed herbicide	Extent of infestation (occurrences)
Reed canarygrass <i>Phalaris arundinacea</i> Perennial Rank: 83	Manually pull or dig small populations of 10 plants or less. Monitor effectiveness. If manual control is ineffective on these small populations then cut or mow seed heads and spot spray with a hand held or backpack sprayer with glyphosate. For populations larger than 10 plants, cut seed heads or mow population and then spot spray with glyphosate. Spray late in the season to ensure herbicide gets translocated to the roots for maximum mortality. All label instructions would be strictly adhered to.	Yes	12
Field sowthistle <i>Sonchus arvensis</i> Perennial Rank: 73	Manually pull or dig small populations of 10 plants or less. Monitor effectiveness for 1 year and spot spray with aminopyralid if manual control is ineffective. For populations larger than 10 plants, spot spray with a hand held or backpack sprayer with aminopyralid. All label instructions would be strictly adhered to.	Yes	1
Bird vetch <i>Vicia cracca</i> Perennial Rank: 73	Past manual treatments on the Chugach National Forest have been ineffective in controlling this species. Spot spray plants with a hand held or backpack sprayer with aminopyralid. All label instructions would be strictly adhered to.	Yes	32
Species listed below will primarily be treated in mineral material sites if/when they occur			
Wild oats <i>Avena fatua</i> Rank: not yet ranked	Monitor population to see if this species persists more than 1-2 years. If the population persists then manually pull or dig small populations of 10 plants or less. Monitor effectiveness. If manual control is ineffective on these small populations then cut or mow seed heads and spot spray with glyphosate. For populations larger than 10 plants, cut seed heads or mow population and then spot spray with glyphosate. Spray late in the season to ensure herbicide gets translocated to the roots for maximum mortality. All label instructions would be strictly adhered to.	Yes	3
Spotted knapweed <i>Centaurea stoebe</i> sp. <i>micranthos</i> Rank: 86	Hand pulling individual plants is the priority treatment. If needed, spot spray with aminopyralid for follow-up to hand pulling.	Yes	Not yet known in project area
Field bindweed <i>Convolvulus arvensis</i> Rank: 56	A combination of hand pulling and spot spraying with aminopyralid would be used and monitored for effectiveness.	Yes	Not yet known in project area

Target species Common names Scientific names Growth habit Invasiveness ranking	Proposed control measures	Proposed herbicide	Extent of infestation (occurrences)
Narrowleaved hawksbeard <i>Crepis tectorum</i> Rank: 56	Spot spraying individual plants with a hand held or backpack sprayer with aminopyralid is the priority treatment with hand pulling individual plants as needed for follow-up treatment.	Yes	134
Scotch broom <i>Cytisus scoparius</i> Rank: 69	Hand pulling individual plants is the priority treatment. If needed, spot spray with a hand held or backpack sprayer with aminopyralid for follow- up to hand pulling.	Yes	Not yet known in project area
Quackgrass <i>Elymus repens</i> Rank: 59	Manually pull or dig small populations of 10 plants or less. Monitor effectiveness. If manual control is ineffective on these small populations then cut or mow seed heads and spot spray with a hand held or backpack sprayer with glyphosate. For populations larger than 10 plants, cut seed heads or mow population and then spot spray with glyphosate. Spray late in the season to ensure herbicide gets translocated to the roots for maximum mortality. All label instructions would be strictly adhered to.	Yes	66
Leafy spurge <i>Euphorbia esula</i> Rank: 84	A combination of hand pulling and if needed, spot spray with a hand held or backpack sprayer with aminopyralid for follow-up treatment.	Yes	Not yet known in project area
Hempnettle <i>Galeopsis</i> sp. Rank: 50	Mow and hand pull with possible application of aminopyralid as needed.	Yes	18
Meadow hawkweed <i>Hieracium caespitosum</i> Rank: 79	Spot spraying individual plants with a hand held or backpack sprayer with aminopyralid is the priority treatment. Using tarps and hand pulling as needed for follow-up treatments.	Yes	Not yet known in project area
Narrowleaf hawkweed <i>Hieracium umbellatum</i> Rank: 51	Spot spraying individual plants with a hand held or backpack sprayer with aminopyralid is the priority treatment. Using tarps and hand pulling as needed for follow-up treatments.	Yes	4
Fall dandelion <i>Leontodon autumnalis</i> Rank: 51	Past manual treatments on the Chugach National Forest have been ineffective in controlling this species. Spot spray plants with a hand held or backpack sprayer with aminopyralid. All label instructions would be strictly adhered to.	Yes	71

Target species Common names Scientific names Growth habit Invasiveness ranking	Proposed control measures	Proposed herbicide	Extent of infestation (occurrences)
Oxeye daisy <i>Leucanthemum vulgare</i> Rank: 61	Spot spraying individual plants with a hand held or backpack sprayer with aminopyralid is the priority treatment. Hand pulling as needed for follow-up treatments.	Yes	248
Purple loosestrife <i>Lythrum salicaria</i> Rank: 84	Spot spraying individual plants with a hand held or backpack sprayer with aminopyralid is the priority treatment. Using tarps and hand pulling as needed for follow-up treatments.	Yes	Not yet known in project area
Bohemian Knotweed <i>Polygonum x bohemicum</i> Rank: 87	Spot spraying individual plants with a hand held or backpack sprayer with aminopyralid is the priority treatment. Stem injection may be used as an alternate treatment. (3 milliliters per stem).	Yes	Not yet known in project area
Black bindweed/wild buckwheat <i>Polygonum convolvulus</i> Rank: 50	Hand pulling individual plants would be priority treatment. Follow up with hand spot spraying of aminopyralid as needed.	Yes	19
Japanese knotweed <i>Polygonum cuspidatum</i> Rank: 87	Spot spraying individual plants with a hand held or backpack sprayer with aminopyralid while flowering is the priority treatment. Stem injection may be used as an alternate treatment. (3 milliliters per stem).	Yes	Not yet known in project area
Giant Knotweed <i>Polygonum sachalinense</i> Rank: 87	Spot spraying individual plants with a hand held or backpack sprayer with aminopyralid while flowering is the priority treatment. Stem injection may be used as an alternate treatment. (3 milliliters per stem).	Yes	Not yet known in project area
Stinking willie <i>Senecio jacobaea</i> Rank: 63	Hand pulling and mowing prior to flowering would be the priority treatment. Spot spraying individual plants with a hand held or backpack sprayer with aminopyralid.	Yes	Not yet known in project area
Common tansy <i>Tanacetum vulgare</i> Rank: 60	Spot spraying individual plants with a hand held or backpack sprayer aminopyralid is the priority treatment. Hand pulling will be used as needed.	Yes	4
Sentless false mayweed <i>Tripleurospermum perforatum</i> Rank: 48	Spot spraying individual plants with a hand held or backpack sprayer with aminopyralid is the priority treatment. Hand pulling will be used as needed.	Yes	28

Appendix 2: Treatment Area Descriptions

Crow Pass. This treatment area encompasses the Crow Pass Trailhead outside Girdwood, Alaska. The invasive species of concern here is bird vetch which occurs in limited areas around the trailhead.

Seward-Turnagain. This treatment area encompasses two sections. The first section is a long stretch of the Seward Highway starting at the Forest boundary south of Girdwood and extending south to Twentymile River. It also includes another small area along the Seward Highway, just before Ingram Creek. Species of concern in this treatment area include butter and eggs, white sweetclover, bird vetch, reed canarygrass, and orange hawkweed.

Portage. This treatment area mainly encompasses Portage Highway and adjacent pullouts and parking areas. Species of concern include Canada thistle, butter and eggs, bird vetch, white sweetclover, and reed canarygrass.

Seward-North. This treatment area includes a section of the Seward Highway that includes Turnagain Pass and the Hope Wye. Species of concern include butter and eggs, field sowthistle, orange hawkweed, yellow sweetclover, white sweetclover and birdsfoot trefoil. There are two State sections that were included because of some high priority infestations. We have coordinated with the State on these sections. The first State section is around milepost 72 of the Seward Highway which is closer to Ingram Creek. There is a large population of orange hawkweed on both sides of the highway. The other State section is around the Canyon Creek bridge where there is a population of birdsfoot trefoil.

Blackstone Mine. This treatment area is south of the Seward-North treatment area. It is the only one that is not associated with a road. This treatment area is approximately one acre, but the actual infestation is only 0.05 acre. The species of concern here is the orange hawkweed that is present just outside a mining cabin.

Hope. This treatment area includes two segments in and around the community of Hope, Alaska. The species of concern in this segment is butter and eggs, bird vetch, and white sweetclover.

Seward-Rabbit. This treatment area is composed of two segments along the Seward Highway near Tern Lake, as well as a portion of Rabbit Road. Species of concern here is reed canarygrass.

Vagt Lake. This treatment area occurs along the Forest Service ROW along a new trail. The species of concern is reed canarygrass.

Sterling. This treatment area is composed of three segments along the Sterling Highway. Species of concern here include butter and eggs, white sweetclover, reed canarygrass, and bird vetch.

Seward-Kenai Lake. This treatment area includes three small segments along the Seward Highway by Kenai Lake. Species of concern here include orange hawkweed and butter and eggs.

Exit Glacier Road. This treatment area includes the portion of the Exit Glacier Road on the Chugach National Forest. Species of concern here include yellow and white sweetclover.